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SOYA BEANS

in

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NOVEMBER, 1926

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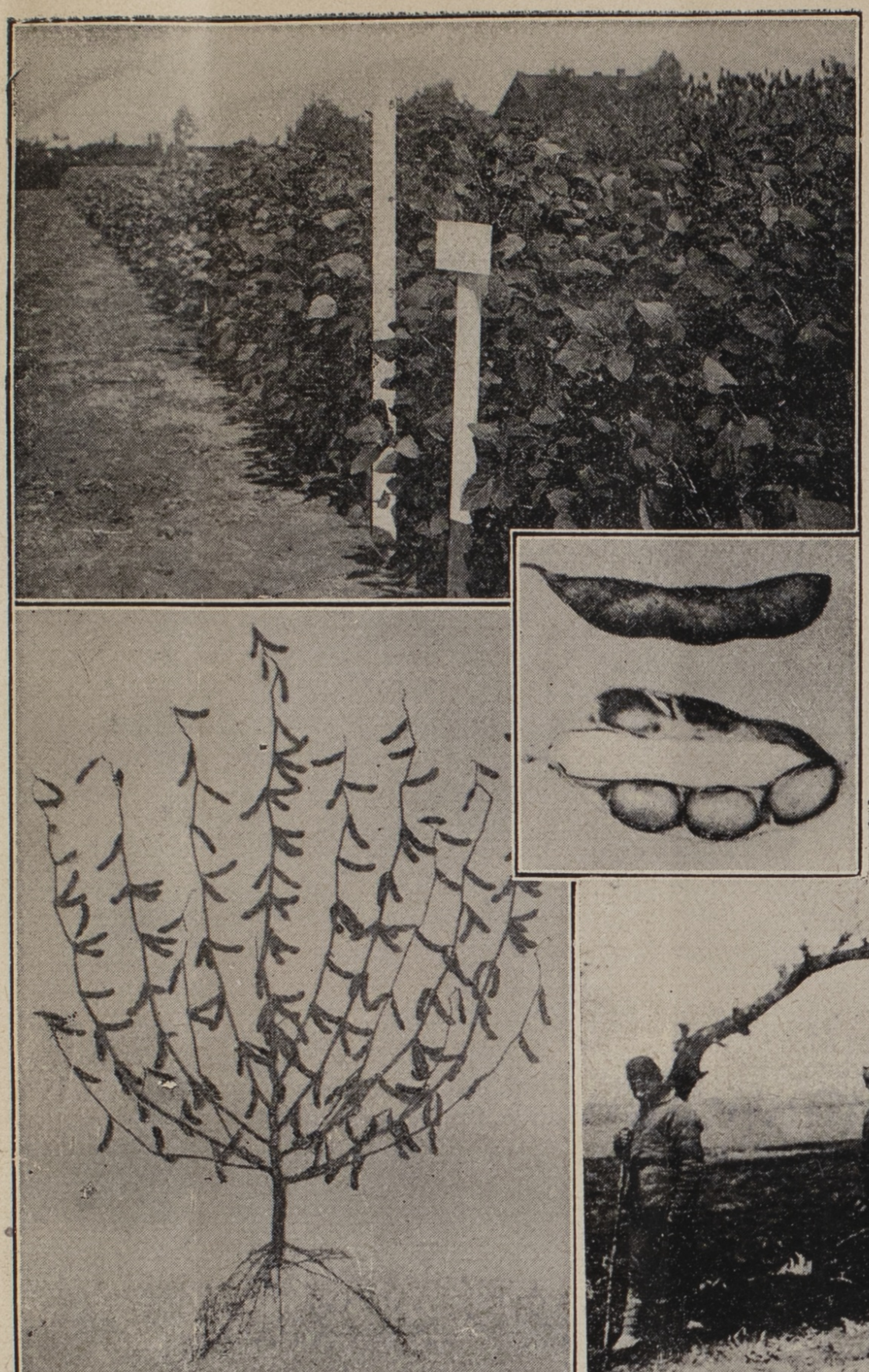

Top : Seed-Bean Farm (Agricultural Experiment Station, Kungchuling).

Centre : Soya Beans in Shells.

Middle Right : Sowing of Seed Beans.

Middle Left : Bean Plant in Harvesting Season.

Bottom : Weeding in Bean Field.

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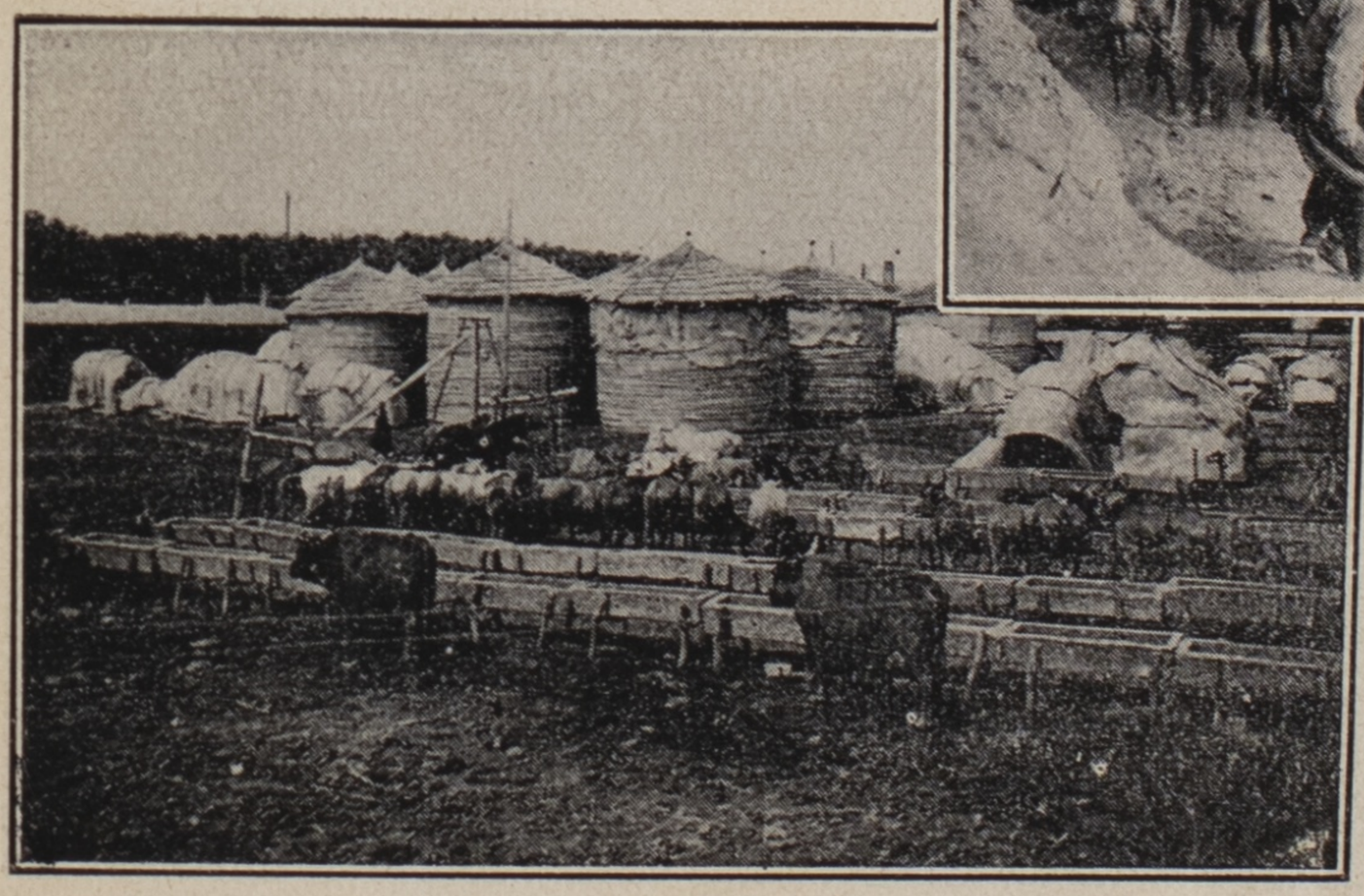
Beans being Threshed
in Farm-Yard.

Beans Harvested & Carted Away.

Beans stored in Osier Bins in the Yard
of the Local Merchant.



Bean Carts wending their way to the
Market in the Interior.

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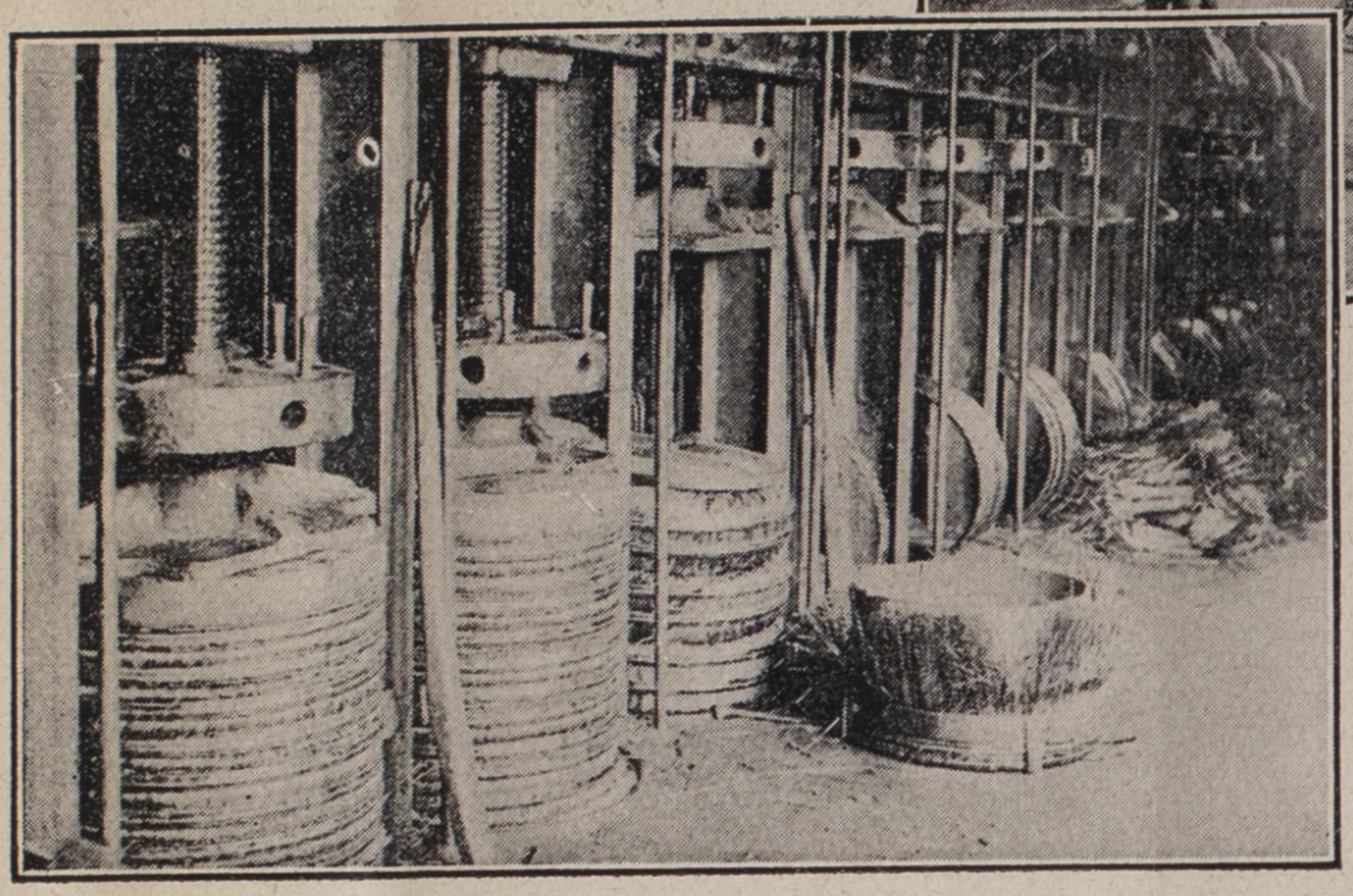
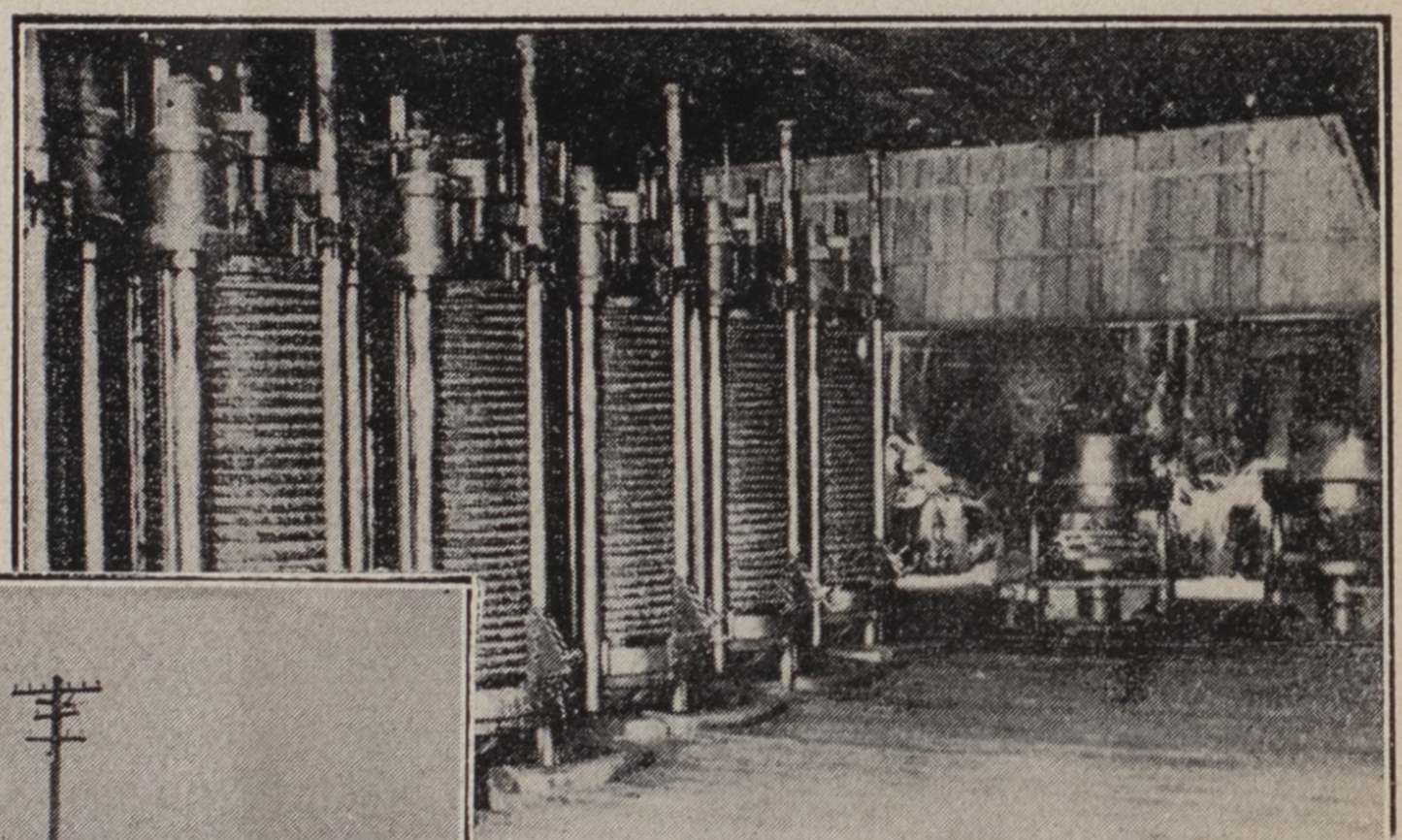
Hills of Bags of Beans in Changchun Station Yard.



Old Screw Patterned Presses in Manchuria.



Hydraulic Pressure System in Manchuria.

Train Loads of Bean Cake to be Shunted to Quay of Shipment.

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SOYA BEANS

CHAPTER I.

HOW MANCHURIAN BEANS ARE PRODUCED

Section 1. How Beans are yielded in the World

The original producing centre of Beans is inferred to be Cochin China, South China, and Java (according to M. de Candolle), but they were first grown as farming crops in China proper about 4,000 years ago. The chief Bean zones are Manchuria, China proper, Japan and Chosen (Korea) all in the Orient, in which Beans have been raised from old times as an important article of food.

Beans formed one of special farming crops raised in the Orient only, until 1908, in which year the Mitsui Bussan Kaisha sent the first trial shipment to Europe, from which time dates the steady rise of Manchurian Beans in popularity. As the export to Europe and America increased year after year, the cultivation of Beans came to be experimented upon in several of the Western countries and in their colonies, but in no instance, it has yet risen above the experimental stage. The production is still very small and no reliable statistics is yet available except for the United States.

The following table gives the chief producing centres in the world:

TABLE I.—BEAN PRODUCTION IN CHIEF PRODUCING CENTRES.

JAPAN

Total production: 3,433,908 koku.

Chief producing zones: Hokkaido gives about 20 per cent of the whole, followed by North-eastern part including Iwate, Ibaraki, and Saitama Prefectures, also Kagoshima, Kumamoto, and Chiba Prefectures coming after them.

Producing conditions: Producing conditions remain stationary, but seen from the area of cultivation, no further extension can be expected.

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CHOSEN (KOREA)

Total production: 4,641,467 koku.

Chief producing zones: Northern Chosen is better suited to Bean cultivation than Southern Chosen owing to its weather and peculiar agricultural conditions and produces more.

Producing conditions: Annual increase promised by reclamation and improved farming methods.

MANCHURIA

Total production: 25,500,000 koku.

Chief producing zones: Liao Valley in South Manchuria and Sungari Valley in North Manchuria.

Producing condition: Owing to reclamation of uncultivated land specially in North Manchuria such as in Sungari Valley, annual increase of production promised.

CHINA PROPER

Total production: 15,000,000 koku.

Chief producing zones: North territory of Central China having for its centre Honan, Hupeh, Chihli and Shantung.

Producing conditions: Producing conditions stationary on the whole.

THE UNITED STATES.

Total production: 608,000 koku.

Chief producing zones: The major portion is produced in North Carolina.

Producing conditions: In North Carolina beans aer harvested, but elsewhere beans are raised for the green fodder.

TABLE II.—BEAN PRODUCTIONS AT WORLD'S BEAN ZONES.

	Japan	Chosen (Korea)	Man. churia	China proper	United States	Total
Area of cultivation (cho)	425,714	805,879	2,778,000	2,300,000	75,900	6,385,493
Total production (koku)	3,433,908	4,641,467	25,500,000	15,000,000	608,000	49,183,375
Per 0.1 cho yield (koku)	0.807	0.567	0.900	0.650	0.745	—
Percentage to world's production	7%	10%	52%	30%	1%	100%

Notes: 1 "cho" is equivalent approximately to 2.5 acres; 1 "koku" to 5 bushels. ~ 1 bushels = 60 lbs 2.2 lb = 1 kg

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Remarks : The figures in the above tables for Japan and Chosen refer to the statistics in the fiscal year 1923, and those for the United States of America, to those in 1921 (the subsequent statistics for the United States are unavailable), but the above figures seem not far from correct. The figures for Manchuria have been estimated by S. M. Railway staff.

As to the figures for China proper, those given by the Government statistics are found altogether too exaggerated, and these figures, too, have been put down also by our estimation.

Thus, the total bean production of the chief bean zones in the world may be estimated at about 48,500,000 koku, and the outputs elsewhere than abovementioned being put together, the total production of the world may be placed at about 50,000,000 koku. Manchurian Beans take up more than 50 per cent of the whole, showing a tendency steady increase in production. This will suffice to indicate what an important place is occupied by Manchurian Beans in the world's production.

Section 2. Bean Cultivation in Manchuria.

A.—HOW PRODUCTION HAS BEEN INCREASED.

While the origin of Bean cultivation in Manchuria is not clearly known, Beans seem to have been brought from Central China districts. In old days, only enough for food seems to have been grown, but since Beans came to be used as oil-giving agency, its production came to be gradually increased. Still the demand for Beans used to be localized, till, after the Sino-Japanese War, Beans and Bean Cake put out in Manchuria came to be exported in Japan, resulting in a sudden expansion of demand. Since the way was opened for export to Europe and America as above stated, Beans and their products—Bean Cake and Bean Oil—have become raised to be commodities in world-wide demand, having at last attained the present day popularity.

Thus the ascent of Manchuran Beans to be one of the most important staple exports of Manchuria, with their demand spread all over the world, while their production has increased by leaps and by bounds dates only 20—30 years back, the existing production being 25,500,000 koku that is over half the world's entire outputs.

B.—MANCHURIA SUITED FOR BEAN CULTIVATION.

How Beans have been raised to such a height of boom is fundamentally due to the high suitability of a large area of land in South and North Manchuria for Bean cultivation in both climate and soil. This suitability is demonstrated by the average production of 0.9 koku per 0.1 cho in Manchuria by the side of 0.8 koku for Japan proper.

Beans are known to thrive in the central and northern parts of the Temperate Zone, in which Manchuria is included.

We shall now look into the meteorological peculiarities in Manchuria and their relation to Bean cultivation.

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a.—METEOROLOGICAL PECULIARITIES.

Atmospheric Temperature

From about October to the following March, the temperature in Manchuria is lower than in Japan proper. However, from April to October, during which the farming crops are sown, grow, and are harvested, the temperature is higher than in Japan, a happy phenomenon very favourable to agriculture.

Supposing Bean seeds are sown in April, they will germinate in the latter part of the same month and will grow in May and June, reaching the climax of growth by August. When in September and October fine weather continues with dry atmosphere and cooler temperature, Beans will ripen and get developed fully.

Thus, the weather conditions in Manchuria are perfectly suited to Beans cultivation, the severe cold in winter serving to kill all harmful insects, if any, without doing the slightest damage.

Precipitation

As regards rainfall, May is comparatively dry, in fact the driest in the year, when the Beans germinate. This point may be held up as a drawback in a sense, but as long as the soil holds enough moisture for the seeds to germinate in, the want will be quite answered. It is indeed better than excessively wet or damp out of proportion to the temperature. In July and August, the temperature is the highest and the so called Manchurian rainy season gives most part of the total annual precipitation during these two months, and by these two causes, the growth of the vegetation is most quickened. In September and October, the rainfall is sharply decreased with a continuation of fine weather, that is adapted to the ripening of the Beans.

Humidity

The degree of humidity is very low in Manchuria. Evaporation goes on actively, especially in spring, as already hinted, which feature, combined with a small rainfall in the germinating season in spring, are anything but favourable to both germination and growth. Still the most active evaporation in summer and autumn reacts excellently on the growth and ripening process of Beans. In particular, the ample evaporation in the harvesting time in autumn goes to dry the Bean grains well, so as to enhance their quality, at the same time, making them fit for a long storage.

b.—MANCHURIAN SOIL & BEAN CULTIVATION.

For Bean cultivation, loamy clay, clay, loam and sandy loam are

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suited in the order mentioned. While the relation between Bean cultivation and the soil constituents is not yet quite clear, Beans, like other species of the leguminous plants, appear to get the nitrogen needed for growth principally through symbiotic action with bacillus redicicola, and very little thereof is directly absorbed from the soil. On this account the amount of nitrogen contained in the soil has not so important an effect on the Bean, as with other species of plants. Any how, a soil possessed of the qualities suited for propagation of bacillus radicicola is regarded as the more desirable.

Manchuria soil, as a rule, is of small particle and cohesive, and is too often ready to turn a heavy clay after a rain. Therefore, Manchurian soil can hardly be called physically excellent. At to its chemical constituents, at many places, shortage of organic matter is noticed, but minera contents being comparatively plentiful, thus chemically speaking, Manchurian soil may be called suited to Bean cultivation.

c.—LOCAL ADAPTABILITY.

Manchuria is nearly equally divided between hilly districts and plains. The plains are traversed by the Liao and the Sungari furnishing fertile farming zones in their valleys. In particular, the Liao Valley has long been reclaimed, producing half the total Bean outputs of Manchuria. The Sungari Valley is far larger in area, but because of its greater distances and want of means of communications from Shantung and Chihli that supply the immigrating coolies, what land is under cultivation is limited, except in its southeastern part. Thereby the agricultural produce was not large in outputs either, but the construction of the Chinese Eastern Railway accelerated the reclamation of land, increasing the produce amounts sharply. Still, an extensive area lies unreclaimed, and for the future increase of Bean production the reclamation of the upper zones of both Liao and Sungari Valleys has got to be depended upon.

We shall now give the extents of Bean fields and Bean production according to the different Provinces:

TABLE III.—BEAN FIELDS & PRODUCTION.

	Fengtien	Kirin	Heilung	Total
Bean fields (unit : 1,000 cho).....	1,009	1,233	720	2,962
Yield (unit : 1,000 koku).....	9,080	9,860	6,500	25,440
Per 0.1 cho yield in "koku".....	0.90	0.80	0.90	—

In Fengtien Province, such Prefectures as Shenyang (containing Mukden), Tiehling, Kaiyuan, and Tungshan (Eastern Hill) District, comprising Tungfeng, Hsifeng, Hsian, and Hailungcheng, in addition to Liaoyang, Kaiping, Haicheng, Ihsien, Changtu, Lishu, Huaite, Tungliao, and Taoan may be held up as the richest Bean zones. In Kirin

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Province, Kirin, Shuangyang, Changchun, Tehui, Itung, Nungan, Fuyu, Yushu, Shuangcheng, Pinhsien (containing Harbin), and Poli may be counted, while in Heilungkiang Province, Lungkiang, Chaochow, Chingkang, Suihua, Hulan, Hailun, Payen, Lanhsi, Paichuan, and Koshan are the chief Bean zones.

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CHAPTER II.

WORLD-WIDE DEMAND FOR MANCHURIAN BEANS.

Heretofore Beans were used mainly for food and cattle-feed, their demand having been limited to the Orient, in which they were produced little beyond the actual needs. After a new demand has been created lately as oil-yielding material, the market for Beans has become remarkably expanded, in fact all over the world. Thus Manchuria that yields half the aggregate world's production has become the greatest centre of accumulation and distribution of Beans.

Section 1. Supply & Demand in Manchuria.

The total production of Beans in Manchuria is estimated at 25,500,000 koku, of which amount the domestic consumption comprises what is taken for food and cattle feed, besides seed for the next season and the raw materials for the bean mills, the remainder being exported abroad.

To tabulate the demand and supply relation:

TABLE IV.—SUPPLY & DEMAND OF BEANS IN MANCHURIA.

For food of Natives, 2,000,000 koku; figured out at 0.08 koku per capita consumption on the basis of the total population of Manchuria being 24,000,000.

Cattle feed, 1,400,000 koku; according to a book on Manchuria & Mongolia.

Seed for next year, 1,400,000: estimated at the average seed amount of 0.5 koku per 1 cho on the basis of 2,778,000 cho, for the total area of Bean cultivation.

Raw material for bean mills (for manufacture of Bean Oil or export) 10,900,000 koku, the mean total exports of Bean Oil for the 5 years of 1921-1925 being 2,350,000 piculs, the above is figured out at the rate of 10 kin Bena Oil per 100 kin Beans.

Raw material for bean mills (for manufacture of Bean Oil for domestic consumption), 2,000,000 koku; figured out at the estimated per capita consumption of $1\frac{1}{2}$-2 kin per annum for 24,000,000 people in Manchuria. Total Domestic consumption (as above scheduled), 17,700,000 koku.

Export Beans, 8,800,000 koku; being the mean of the annual total exports of 1921-1925.

Aggregate consumption (representing the grand total production, 26,500,000 koku).

As above scheduled, the grand total production in all Manchuria, as worked out from the various ways of consumption is estimated to be 26,500,000 koku. Of the above figures, the pure domestic consumption

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in the matter of food, cattle-feed, seed beans, etc., amount to only 4,800,000 koku, while 13,000,000 koku, that is merely one half of the total production, is used by the bean mills for obtaining oil and the balance of 8,000,000 koku is exported abroad in the form of Beans.

Now, 80-90 per cent of the Bean Oil and Bean Cake put out by the mills being shipped abroad or into China proper, so that altogether about 20,000,000 koku of Manchurian Beans partly in Beans and partly in the form of Bean Cake and Bean Oil, is being forwarded to China proper and Japan (the larger portion of Bean Cake is exported to Japan as fertilizer and the major portion of Bean Oil to Europe).

The above is thought sufficient to let one judge what a position of importance is occupied by Beans and Bean milling in the economic community of Manchuria.

Section 2. Bean Demands in Destination Countries.

Out of 8,880,000 koku exported abroad in the form of Beans, allowing for what variation there is according to years, about 3,000,000 koku is shipped to Japan; about 2,000,000 koku to China proper, about 2,500,000 for Europe; about 600,000 koku for Java, and the balance of about 1,000,000 koku more for elsewhere.

A.—DEMANDS IN JAPAN.

Before 1907, the total bean consumption in Japan, according to the mean figures for the past 10 years, was about 4,500,000 koku with only immaterial fluctuations. The consumption amount increased by degrees subsequently, and in 1918-1919, in which the figures reached the zenith, as much as 8,500,000 koku was wanted a year.

How the Bean consumption increased since 1907 was chiefly owing to the import of Manchurian Beans as material for oil-producing agent, with the growth of bean milling industry. This industry enjoyed the greatest boom in 1918-1919 which marked the height of business inflation in Japan during the Great War. As, on the close of War, the reactional depression swooped upon the world, the bean milling enterprises recorded a sharp decline, showing a tendency of decrease in the amount of beans.

The latest domestic consumption may be accepted at 8,000,000 koku, of which 3,500,000-4,000,000 koku is supplied at home, and of the balance of 4,300,000-4,400,000 koku, 1,300,000-1,400,000 koku is obtained from Chosen (Korea), the remaining 3,000,000 koku being Manchurian Beans. More than half the Manchurian Beans imported into Japan proper serves as oil-giving material in the mills, the balance being for making "soy" and "miso" and other articles of food.

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B.—IN CHINA PROPER.

In China proper, little over enough for local demand is yield in any part of the country in principle. However, in Shanghai and South China, in which consumption exceeds supply, Manchurian Beans have to be exported to make up the shortage of supply. In late years, about 2,000,000 koku of Beans is sent into China proper. What the Beans are used for in China proper is not very clear, but most thereof is employed in making soy, "miso", "tofu" (bean curd) and other articles of food besides cattle-feed. Some amount is employed at the bean mills, but in most cases, oil-expressing is carried on at private homes as a sort of bi-industry, (Hankow, etc., being excepted). Therefore what is put to this kind of use is not large. As regards about 2,000,000 koku imported into Shanghai and South China, the greater parts is used for food, only little being for oil milling material.

C.—IN JAVA (DUTCH EAST INDIES)

In recent years, Java is importing Manchurian Beans to the amount of 600,000 koku or so annually. For meteorological reasons no beans are grown in Java. The first shipment of Beans to that island originated in importing Beans from Tientsin and Chefoo by some old Chinese settlers there. The natives got acquainted with Beans, and now they have become an article of staple food cheap in price. Most of the demand in the island is filled by Manchurian Beans.

D.—IN EUROPEAN COUNTRIES.

In European countries, the cultivation of Beans has not yet gone above the experimental stage. Therefore, Beans for domestic consumption are entirely imported from Manchuria. The chief consumption of Beans in Europe is as oil-yielding agency. Of late the amount used for food is on the increase, but still it bears no comparison with the other in quantity.

The heaviest consumers are England, Holland, and Denmark. The major portion is for the use of the mills at Hull and Liverpool (England), Copenhagen (Denmark), and Rotterdam and Amsterdam (Holland) and elsewhere. Germany's consumption was above either, but the demands got interrupted during the Great War, and now with the reconstruction of her industry, she promises to be the heaviest customer of Manchurian Beans in Europe again. Actually, with the revival of oil-industry, import of Manchurian Beans increased. Then comes Sweden, and others are hardly worth mentioning.

The total annual consumption of Manchurian Beans in Europe amount to 2,500,000 koku.

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CHAPTER III.

USES OF BEANS.

Section 1. Introduction.

The uses of Beans may be roughly divided into the following:

(a) Food: In the chief bean producing countries in the Orient like Japan ,China, Chosen, etc. Beans have from old times been cooked and served at table, or else been made into "tofu" (bean curd), roast bean powder, malt, "miso", "soy", etc., constituting an article of food not to be dispensed with.

(b) Cattle feed: Beans being possessed of high nutritive value as food of course make an excellent cattle-feed. However, no cattle-feed requiring fat contents in a large measure, the residue of Beans left after the oil contents have been taken off will make a better feed. Still, in China, Chosen, etc., Beans are used in a considerable quantity as cattle-feed.

(c) Fertilizer: Beans containing much oil, and such oil contents make against the plant growng as fertilizer. At present, either Bean Cake is employed for manure, or else, in many cases, Beans or Bean Cake is used to feed cattle on, their droppings being utilized as fertilizer.

(d) Oil-yielding material: Lately as chemical industry has greatly developed, the enterprise of obtaining oil has become more flourishing, and what is consumed as such has come to be above what has been employed as food, in fact taking-up more than half the total bean production, in consequence of more extensive uses, to which Bean Oil and Cake are put to.

Thus, Beans have outgrown their old uses as food and cattle feed, as the case used to be among Oriental countries in recent years, and have developed into an article of food or an industrial material mainly as oil-giving seed (each commanding a world-wide demand).

What makes Beans a promising oil-yielding agency is because of its having the following excellent properties:

(1) The essence of Beans is very well suited for industrial material for oil mills, food, and, cattle-feed.
(2) Easy to cultivate.
(3) Cheap in price.
(4) Convenient to be stored.
(5) Close proximity to the greatest Bean centre like Manchuria, & facility to procure Beans in any quantity.

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The following table will give an idea of general uses of Beans:—

TABLE V.—GENERAL USES OF BEANS.

BEANS

(1) Cattle feed.
(2) Fertilizer.
(3) Food :—Cooked Beans, malt, "tofu" (Bean curd), bean milk, "miso," "soy," bean powder, confectionery, & sauce-making material.

BEAN OIL

(Obtained by expressing & chemical extraction)

Direct uses :—Food, a source of light, & lubricator.

Manufactured into :—Refined Bean Oil, salad oil, substitute for lard and tallow, substitute for butter (oleomargarine), soap, glycerine, fatty acid, water paint (Tantalus), etc., substitute for Indian rubber, a substitute for kerosene, hydrogenated oil (made into candles, etc.), & paint materials also for making vanish, linoleum, etc.

BEAN CAKE

(Round cake, plate cake, & bean meal)

Direct uses : Fertilizer & Cattle-feed.

Manufactured into :—Protein products like "Ajinomoto" (a Japanese flavour), size for paper-making, substitute for celluloid (like satolite) water paint like solite, etc., & "Nutrition," etc.

FOOD

"Soy," "miso," "tofu" bean powder sometime used for wheat flour substitute, & sauce making material.

Section 2. Value of Beans as Food.

A.—FROM GENERAL CONSTITUENTS.

The constituents of Beans vary more or less according to places of origin, kinds, and years in which they are grown, but the following are the average consituents obtained from different classes under the S.M.R. Co. Mixed Storage that may be said to represent Manchurian Beans (being the mean for 1919 & 1920):

Water 8.5%; crude fat, 18%; crude protein, 40%; nitrogen free extract & crude fibre, 28%; ash 5.5%.

As is seen from the above, Beans make an excellent article of food containing much protein and fat that have the most important relation to nutrition.

In the amount of protein, it defies other cereals, other kinds of pulse and even meat itself.

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B.—FOOD VALUE OF BEANS, FROM NEW DIETETIC POINT.

From the up-to-date point of view of dietetics in its advanced stage, the general constituents, as above enumerated, will furnish anything but satisfactory data for determining the dietetic value of a food. Taking a stride forward, the nature of constitutents, especially the protein that forms the chief constituent, that is, in both kind and contents of amino acid composing the protein, should be carefully looked into. Besides, beans should be observed from a vitaminic standpoint or the results of animal tests to get at a complete estimate of their nutritive value.

Concluding from the results of the above enumerated tests, Beans are found not wanting in either kind or contents of amino acid making up the protein, proving them as leaving nothing to be desired in nutritive value. Again, according to practical animal tests, they are pronounced as the most excellent of vegetable protein only next to beef and fish.

Furthermore, Beans contain much fat and by the latest researches, Bean Oil is found to contain vitamin A, making it more than a peer to any of the vegetable oils existing. That Beans are rich in vitamin B may be said to enhance their nutritive value all the more. Thus in the light of the latest dietetic viewpoint, Beans may be classed very high in nutritive value. These are theoretical inferences, but the nutritive value of Bean grains, as worked out through animal tests, has been demonstrated as no less superb.

C.—CONCLUSION.

The Orientals who have had rice, barley, etc. for staple food from old times are supplied with only short nutrition comparatively. In particular, Japan, unlike Europe and America, was a Buddhist country from ancient days and according to the Buddhist codes only little meat diet was in vogue until the Western diet was imported. Thus, the use of Beans and food made therefrom to go along with rice may be said to have furnished a proper amount of nutrition towards sustaining the physical strength of the people. From this consideration, what Beans have contributed to the living of the Japanese should be called incalculable.

As above stated, from a standpoint of nutritive value, Beans, as a material of food, are bound to have their use still further enlarged in the future. In Europe and America, this point is taken notice of, and Beans are wrought upon in various ways with help of science to prepare new kinds of food experimentally, so as to contribute to the solution of the food problem. Already confections, bread, etc. made from bean milk, bean powder, and bean residue are on the market.

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Section 3. Uses of Bean Oil.

A.—PROPERTIES OF BEAN OIL

That Bean Oil received a recognition on the world's fat and oil market, including Europe and America, dates only a little over 10 years back. Until then, it used to serve only as food, a source of light, and a lubricator, as already stated, its demand scarcely going beyond the borders of China.

The fact that in the short span of little over 10 years the uses of Bean Oil should have been so enlarged as at present is mainly owing to the advantage it has in being manufactured and supplied to the customers more cheaply than any other vegetable oil, besides having the characteristics to serve an excellent substitute for kindred oils either as food or for industrial uses.

For instance, in respect of iodine value, Bean Oil is available as a substitute for linseed oil for paint making material. Then, by refining it, it is good to take the place of olive oil, cotton seed oil, etc. as material for making salad oil, artificial lard, oleomargarine, etc. Next, it is admitted to make a fine material for making soap.

The most extensive uses of Bean Oil are (1) as material for manufacture of salad oil, lard, oleomargarine, etc.; (2) for making a solvent for paint, varnish, linoleum, etc.; and (3) as soap material.

This property to make a good substitute in all the chief kinds of uses of oil shows by itself how broad and varied its utilities are. However, with all these advantages, Bean Oil is wanting in any exclusive merit entitling it to the first place in any field of utility, defying rivalry by other oils. For instance, linseed oil is unsuited to food, but has no peer as paint-making material. So when linseed oil is supplied in abundance and at moderate pirces, Bean Oil will be thrown far into the back ground where it will be almost forgotten by the paint manufacturers, and its demand will increase according as the supply of linseed oil is found short or is dear. Taking up olive oil and cotton-seed oil, both of which make poor paint-making materials, but they occupy the foremost places for food purposes, quite controlling Bean Oil. Lastly, as soap making material, Bean Oil falls far behind peanut oil, palm oil, olive oil, copra oil, olive oil, copra oil, cotton-seed oil, etc.

Thus, while the uses of Bean Oil cover a very wide range indeed, it does not make a fit material to turn out a first grade product in any form, and consequently its price is susceptible to the influence of the oil markets abroad. Only Bean Oil admits of being manufactured by a very simple process and at low cost, besides containing little free fatty acid that renders it good for a long storage in the form of crude oil.

Besides, the bean mills in Manchuria, in view of the large and

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dependable demand for Bean Cake, regard Bean Oil by way of a by-product, and may dispose of it at almost any current quotation. Therefore Bean Oil put out in Manchuria to the extent of over 100,000 tons can well afford to readjust itself to the prevailing fat and oil market conditions abroad, and on this account, a demand overseas has been on the increase year after year, and this tendency is most likely to be kept up right along.

B.—MISCELLANEOUS USES OF BEAN OIL.

(1) Direct Uses (native): Native uses of Bean Oil consist chiefly of frying bean curd and other articles of food with, and general cooking uses, besides as a source of light and lubricator.

(2) Refined Bean Oil for table use: Crude Bean oil, on being deodorized and refined otherwise, makes a refined oil without an offensive smell and having an inviting flavour, making itself fit to serve as an excellent substitute for olive oil, salad oil, etc. Sometimes it is mixed with a kind of table oil.

Actually at Dairen, the Nisshin Oil Mills (Mr. J. Furusawa, Managing Director) has managed to produce a refined oil of fairly good quantity, supplying it to the market as substitute for salad oil, and it is being favourably received. Besides, in recent years, in Japan proper, refined bean oil is rising in demand as a substitute for rape-seed oil and sesame seed oil for frying purposes.

(3) Substitute for Lard: As substitute for lard is made from lard or lard stearin, with which tallow stearin, cotton-seed stearin, cotton seed oil, sesame oil, cocoanut oil, palm oil, etc., are mixed.

However, as animal fat supply has become short, cotton-seed oil, which has been in popular use in this direction has found its uses remarkably extended. Consequently it has been running short and is being quoted dear. On this account, Bean Oil has come to serve as substitute for cotton seed oil in a considerable amount. Not only is Bean Oil employed in liquid form, but also in its hydrogenated form, Bean Oil has begun to be used mixedly with a substitute for lard for solid animal fat.

(4) Substitute for Butter: The steadily increasing demand for milk has outstripped the supply causing the dairy products to ascend in price by degrees. Consequently the manufacture of oleomargarine has become more active, and Bean Oil, too, is being employed as one of the materials.

A noticeable feature has made its appearance in the invention of how to hydrogenate liquid oil by applying hydrogen. Since, hydrogenated Bean Oil is being employed as a material for manufacturing margarine. The amount of Bean Oil converted into hyrogenated form and also as

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margarine in liquid form as a substitute for cotton-seed oil has shown a tendency to increase remarkably.

(5) Paint solvent: The iodine value of Bean Oil ranges between 130 and 140. It should be classed under the head of semi-drying oil but is sometimes classified as drier.

As a solvent for paint, varnish, linoleum and such like, linseed oil, a pronounced drier, has been in the most extensive use, followed with such as yemola oil, palm oil, etc. that have each has a strong drying property.

Recently, even a semi-drying oil like Bean Oil, if it is boiled on being mixed with such drying agency as manganese borate, manganese resinate, manganese cobalt, etc., so as to make a boiled oil, is found to acquire much drying property, and suitable for a substitute for a paint solvent. Accordingly, Bean Oil, mixed with linseed oil and some other drying oil, is finding an extensive use in this new field.

(6) Soap: Bean Oil like other kinds of oil is used freely as soap-making material. For making hard soap, it ranks below peanut oil, palm oil, copra oil, olive oil and cotton-seed oil. It is better suited for making softer varieties of soap. It is also used oftener for manufacture of laundry or industrial soap that is consumed in a large quantity than for making toiiet soap of high grades. Lately, hydrogenated Bean Oil has also come to be used for making soap.

(7) Glycerine and fatty acid: During the Great War, Bean Oil got decomposed by some special process into glycerine and fatty acid. Glycerine was used for making gun-powder, medicines and toilet articles, while fatty acid met demand of soap manufacturers.

(8) Candles: By decomposing hydrogenating Bean Oil, stearin, a solid fatty acid, is obtained which is good for candle-making.

(9) Water proof: Taking note of the water proof property of aluminium salt of fatty acid, Mr. T. Suzuki, one of the best known chemists ever connected with the S.M.R. Co., Dairen, made aluminium soap, naming it Tantalus which was manufactured and sold by the Dairen Solite Co. till a few years ago.

The manufacture of a water proof of this kind is promising.

(10) Substitute for Petroleum: At the S.M.R. Co. Central Laboratory, fatty acid of lime was subjected to dry distillation by means of Bean Oil to manufacture a combustible oil as a substitute for petroleum. The same experiments gave a promise of industrial success. While this new industry has not yet been on an economically feasible basis, it is pronounced to justify an adoption as a source of supply of liquid fuel in time of emergency, especially because of its giving glycerine for bye-product.

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(11) Substitute for India Rubber, etc.: Experiments in these lines still belong to an experimental stage.

Section 4. Uses of Bean Cake.

A.—AS FERTILIZER.

Bean Cake turned out by the mills in Manchuria mostly goes to Japan, leaving part of the rest to be shipped to South China as manure for paddy fields, mulberry fields, etc.

Among the constituents of Bean Cake, nitrogen, phosphoric acid, and potassium that make up the three indispensable factors for manure are contained, nitrogen contents amounting to 7% or so in Bean Cake. It will thus serve as an efficacious fertilizer to all kinds of plants or crops, excepting such as do not need much nitrogen. Particularly nitrogen in Bean Cake has a high absorbing and fertilizing power, commending itself well as nitrogen manure. While 7% of nitrogen is contained in Bean Cake, 1% of phosphoric acid and 2% of potassium are found, and for this reason, the application of Bean Cake, together with phosphoric acid and potassium manures is heartily recommended.

In short, Bean Cake ranks formost on the list of fertilizers on the market in Japan. It is an efficacious nitrogen manure, and not only supplies nitrogen but supplements the organic matter of the soil. Bean Cake is not only the cheapest among its kindred residues, but because of its larger nitrogen contents, it commends itself to wider popularity.

B.—BEAN CAKE AS CATTLE FEED.

Bean Cake, in digestive property and in the amount of protein, compares well with cotton-seed cake and peanut cake, beating other residua of kindred kinds. It makes a very fine cattle-feed free from a harmful effect to the cattle that are fed thereon, as the case often is with other kinds of residua. No wonder in Manchuria, China, etc., it has long been in vogue as excellent cattle-feed from old times.

At present, the major portion of Bean Cake exported to Japan is used as nitrogen manure, as already mentioned.

In case of the demand for Bean Cake being desired to be developed abroad, it should be made to serve for cattle-feed, and from this point of view, the present round cake should be converted into either plate cake or Bean meal to facilitate transportation.

The greater portion of Manchurian Beans exported to Europe and America will first get its oil contents expressed or extracted chemically before it is employed as cattle-feed. It is seldom used as fertilizer as in Japan.

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C.—BEAN POWDER MADE FROM BEAN CAKE & ITS USES.

Bean powder made from Beans containing much fatty substance offers sundry inconveniences in the process of being put into divers uses. On this account, Bean residuum left after the oil has been separated from Beans serves the purpose better. Compared with wheat flour, this Bean residuum is both richer in nutritive value and cheaper in market value. On this account, to tap the market in this direction will prove worth while. Only the odour of Beans and the "heaviness of the substance from the culinary point of view are drawbacks which, however, with the prosecution of the study, are both demonstrated to admit of being overcome.

Therefore, if a proper amount of wheat flour, rice flour, sugar, and other ingredients be mixed, bean residuum will make a splendid material for manufacture of bread, pastry, etc.

Actually in Europe and America, its utility in this directon has been the more popular. In Manchuria, China, Japan, etc., too, this happy example is being followed oftener and more widely, and the expansion of utility in this respect seems quite assured.

D.—"SOY" MADE FROM BEAN RESIDUUM.

The experimental Brewery & Fermentory of the Commerce & Industry Ministry, oil-free beans or bean residuum has been experimentally used for fermenting "soy" from, instead of beans, and it has been clearly established that oil-free beans can produce a "soy" of a better quality at a cheaper cost, and in the light of these experiments, the use of bean residuum for the purpose is being recommended. Actually in Japan proper, a few "soy" fermenters hav taken to using Bean meal for the material, and the market in this direction promises a remarkable enlargement.

E.—"AJI-NO-MOTO" MADE FROM BEAN RESIDUUM.

In the amino acid that constitutes bean protein is contained much glustamic acid that serves as the chief essence of "ajinomoto", a very popular flavour at Japonese table. Thus, by decomposing the constituents of bean residuum, the manufacture of glutamic acid soda will be easily accomplished.

The matter lies under a close study in various quarters, and this enterprise, too, has been raised to a paying level.

F.—WATER-PAINT MADE

Solite is a water paint, in which bean protein and lime have been made to unite. It was invented by Mr. T. Suzuki (as above stated) and

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was manufactured and sold by the Dairen Solite & Co. till a few years ago. The manufacture of a water paint of this description has a great future.

G.—PROTEIN RRODUCTS MADE FROM BEAN RESIDUUM.

Protein products made from Bean residuum such as size for manufacture of paper, celluloid substitutes, satolite, "Nutrition," medicinal substances, etc., is not yet out of an experimental stage, but each seems to hold out an interesting and promising prospect.

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CHAPTER IV.

BEAN MILLING IN MANCHURIA.

Section 1. History of Development.

Bean milling industry was founded in China a few hundred years ago. In Manchuria, hemp oil mills used to be practically all that existed till about 60 years ago. About Tiehling and Changchun which then made important Bean markets, the process of expressing oil from hempseed was applied to Beans with flattering results, and this opened bean milling industry in Manchuria.

Those engaged in the new enterprise rapidly increased in Manchuria, and the demand for bean oil keeping rising, hempseed oil found its uses gradually reduced, and in time, the name of an oil mill came to refer to a bean oil factory. At that time, the object of the mills lay chiefly in obtaining Bean Oil, and Bean Cake being regarded as only a bye-product good only for cattle feed. Still the scope of demand was of practically local character, and the milling process was conducted very often by hand or by means of a donkey. In short, the whole affair was a primitive and a small-scaled thing.

The Sino-Japanese War, 1894-1895, marked the opening of export of Bean Cake to Japan. As its fertilizing value became recognized, its demand expanded all at once, inflating the annual export to Japan.

The mills in Manchuria, from this epoch-making time, their reversed estimation of Bean Oil and Cake, giving precedence to Bean Cake over Bean Oil.

In recent years, since, from the universal shortage of oil and fat stocks all over the world, Manchurian Bean Oil came to be run after in all parts of the world, its exports to the West has been quickened. It reached the zenith of its popularity during the Great War as everybody knows. Thus Bean Cake has its principal market in Japan and South China as an important manure, while Bean Oil has made itself a favourite on the American and European markets as a food and an industrial raw material. And this is how the bean milling industry in Manchuria has acquired its present importance and activity.

Section 2. Oil Milling Processes.

The prevailing oil milling processes in Manchuria may be divided into the following kinds:

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(1) Manufacture of round Bean Cake by expressing.
(2) Manufacture of plate Bean Cake by expressing.
(3) Benzine extraction.

We might further sub-classify the expressing and extracting processes as under:

A.—EXPRESSING PROCESS.

(With the sole exception of Honen Bean Mill, Dairen, in all Manchuria).

1. BY PROCESS OF OPERATION

(A) Old or native mills.
Using draught animals or worked by hand.

(B) By new or mechanical process.
Chiefly operated by mechanical & motive power.

2. BY KINDS OF EXPRESSING DEVICES.

a. Wedge Pattern.

The wedge pattern for expressing purposes is what was in vogue before Beans and products rose to be world-wide merchandise and their demand was still confined within the borders of China. It formed part of the small-scaled and most primitive milling scheme, and is still maintained by minor mills in the interior.

b. Screw Pattern.

Use by the Taikuyuan Mill, Yingkou, in 1896, was the first of this pattern to be used.

By this pattern the expressing process depends also on manual labour, but, compared with the wedge pattern, labour and time and also space may be economized, rendering it fit for a large-scaled production. Many mills using mechanical appliances still maintain this pattern, and the majority of mills along the S.M.R. Lines belong to this class.

c. Hydraulic Pressure System.

(a) *Round Bean Cake*:

Round Bean Cake is put out as in the case of the wedge and the screw pattern. It is an improvement on the screw pattern and has been recruiting a larger number of clientele. In fact, a greater number of Dairen mills are run on this system.

(b) *Plate Bean Cake*:

Part of the Nisshin Oil Mills, Dairen, is turning out plate Bean

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Cake. The Kabalkin Mill, Harbin, is the only other plant in Manchuria that has adopted the new process that is considered as the advanced.

B.—BY CHEMICAL EXTRACTION.

The oil contents of Beans are extracted by means of a chemical solvent and is the most up-to-date process. For solvent, benzine is the most popular, benzol coming after it. In Manchuria the Honen Bean Mill, Dairen, is the only factory operated on this system. However, in Japan proper the system is predominant.

Section 3. Advantages & Disadvantages of Different Processes.

A.—WEDGE, SCREW, & HYDRAULIC SYSTEMS COMPARED.

As already stated, the wedge pattern is the oldest by which system almost the whole of the oil expressing and other works at the mill are done almost entirely by manual labour sometimes with animal help. Consequently it has only a limited producing capacity, while a comparatively large area is wanted for the site of the mill and for working room. Now that Bean Cake and Bean Oil have become world-wide commidities requiring a rapid and extensive production, so as to bring its price as low as possible, an out-of-date process like the wedge pattern might well be considered as having outlived its usefulness. Actually, along the S.M.R. Lines, at the chief centres, almost all larger plants have become mechanically equipped, and the increase in number of those that have installed the hydraulic pressure system, being further improvement on the screw pattern, might be accepted as only a matter of course. In Dairen, where an extensive production is kept up, most of the mills are possessed of the hydraulic pressure system.

However, for a small mill at a remote outlandish place, that has to fill only the local meagre need, the wedge pattern that costs only a small sum of money, may be worked at an economic advantage by the cheap native labour, and this mainly accounts for the presence of many wedge-mills in the country.

The screw pattern may be regarded as a transitory medium between the wedge pattern and the comparatively new hydraulic pressure system.

B.—ROUND CAKE, PLATE CAKE, & EXTRACTION SYSTEM COMPARED.

Let us now compare the producing capacities of the different systems, the constituents of the different kinds of bean residua and their respective merits to their users.

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TABLE VI.—PRODUCING CAPACITIES COMPARED.

	Round Cake	Plate Cake	Extraction System
Beans for material	100 kin	100 kin	100 kin
Bean Cake	94.8 kin	83 ,,	80 ,,
Bean Oil	10 ,,	12 ,,	14 ,,
Remarks :.....	gain in weight 4.8%	loss in weight 5%	loss in weight 6%

TABLE VII.—CONSTITUENTS OF BEAN RESIDUA COMPARED.

	By chemical extraction		
	Round cake	Plate cake	Bean meal
Water	16.8%	10.6%	10.4%
Crude fat	7.3%	5.7%	2.1%
Protein	40.1%	43.3%	45.5%
Carbon hydrate	24.6%	29.0%	24.2%
Fibre	5.8%	5.5%	4.8%
Ash	5.3%	5.9%	6.1%

1. ADVANTAGES & DISADVANTAGES OF EXTRACTION SYSTEM.

By the benzine extraction system, the oil percentage obtainable is 14 per cent of the Beans used as material, the oil left in the residuum being reduced to only 2.5 per cent or so. Besides, Bean meal is easy to handle and good to look at, and very convenient to be used, besides having a high fertilizing property. Therefore, it is 10-20 per cent higher in price than round cake, etc. Only the chemical extraction system requiries a complicated installation thereby fixing a large sum of capital. Besides, the dear price of benzine raises the producing cost. Moreover, because of its being in the form of meal, receptacles of some form are wanted for both storage and transportation, tending to raise the steamer freights all the higher.

In Manchuria, Bean Cake is handled in such an immense quantity, and bean meal with its limited production can not enjoy the benefit of the Mixed Storage System.

The Chemical extraction system, permitting of the largest oil percentage to be extracted, may be held as an ideal process, and when some day the solvent comes down in price, while Bean Oil goes up, and labour wages ascend higher, with the chemical extraction applicances better developed, this process is expected to grow very popular as the most commendable and progressive method.

2. ADVANTAGES & DISADVANTAGES OF BEAN PLATE.

As above seen, plate cake gives 12 per cent or so of oil, retaining

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about 6 per cent oil left therein. It is best suited for cattle-feed. Most of Beans exported to Europe and America at present are being expressed of the oil contents by this system.

Then, plate cake, compared with round cake, contains less water, the water percentage being only about 10%. Therefore, when plate cake is in increasing demand as cattle-feed on European and American markets, it will be found the best suited for a long and distant shipment through the Tropics without danger of deterioration in quality.

Only, plate cake, compared with round cake, requires a more intricate installation besides a higher pressure to be applied, and while a kind of rush is good enough for wrapping the boiled beans with to be put under the press by the former process, bags knit of human hair, camels' hair, etc., that are quite expensive, have got to be used to put the boiled beans in, ready for the expressing machine. Naturally the producing costs run higher. Besides, plate cake being in the form of a rather thin plate of oblong shape, it is liable to get broken while in transit, and to protect it, it must be packed in gunnies. Moreover, Bean Oil produced at a plate cake mill being found to contain protein also, if subjected to a high temperature, it is liable to turn black in colour, and for this reason, it has got to be refined. In short, whilst plate cake, because of its high quality and also of the larger oil percentage obtainable, is superior to round Bean Cake, yet the more intricate nature of equipments it requires wants a larger capital to be fixed, and besides on account of the higher cost of production from the causes abovementioned, it has got to be quoted at least more than 20 per cent dearer than round Bean Cake, making it less suited for the Japanese market, on which the assets of a fertilizer count everything at present. However, once plate cake grows more popular as cattle-feed in Europe and America, its manufacture will come to be acknowledged as quite a flourishing undertaking.

3. ADVANTAGES & DISADVANTAGES OF HYDRAULIC PRESSURE SYSTEM.

The round cake system, viewed from the oil percentage yielded and the quality of Bean Cake obtainble, may be classed as the more primitive than the two abovementioned processes. The reasons why almost all the mills in Manchuria are being run on this system are: firstly because of the simplicity of equipments and manufacturing process, keeping the producing costs comparatively low; secondly because Bean Cake, being round and solid, needs no receptacles for the purpose of transportation or storage, and when loaded into cargo steamer, it will help to balance the relation between space and weight on board; thirdly because, in he Mixed Storage System, by which large quantities

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of Bean Cake are handled, some such simplicity in form and shape is deemed as highly desirable; fourthly because in a district like Manchuria, in which labour is cheap, the need of fine, delicate mechanical appliances costing heavily, as the case too often is abroad, is not felt so keenly, and to adapt native labour to the mechanical operations, the existing hydraulic system, by which Bean Cake is put out, is considered as quite well adapted to the present condition in Manchuria; fifthly because, in the present stage of general business, round Bean Cake may be made an object of forward contract transactions on the Exchange for Manchuria and Japan, while no similar thing can be said of bean meal. However, it has long been talked about among the enlightened classes that the round cake system is far from ideal and it is a matter of urgency to adopt a better and more economical process of obtaining oil that will meet better the new requirements of the Bean Oil and Cake markets.

Section 4. Bean Mills in Manchuria.

Among the bean mills in Manchuria, Dairen and Harbin have plants equipped with comparatively advanced type of machinery, the others being almost entirely old-patterned. We shall now proceed to give the mechanical equipments of the leading mills in Manchuria, together with their producing capacities.

TABLE VIII.—BEAN MILLS IN MANCHURIA.

	No. of mills	Hydraulic pressure system	Screw pattern	Wedge pattern	Daily producing capacity. Bean Cake pieces	Bean Oil kin
Dairen	86	1,873	3,067	—	226,461	1,342,305
Yingkou	22	20	726	—	21,790	108,950
Antung	24	100	1,077	108	40,025	200,125
Harbin	43	505	1,429	—	78,537	392,685
Along railways in North Manchuria	18	22	259	18	9,514	47,570
Along railways in South Manchuria	258	208	3,379	156	109,752	548,760
Total	447	2,728	9,937	362	528,097	2,640,395

Thus, in all Manchuria, there are 447 mills (the districts outside along the Railways being excepted) that are equapped with 2,728 hydraulic presses, 9,937 screw presses, and 362 wedge presses, turning out amongst them 528,079 pieces Bean Cake and 2,640,395 kin Bean Oil, and using about 18,000 tons Beans per day. The annual total production of Bean Cake and Bean Oil in Manchuria, subject to variation according to years, may be put at 60,000,000 pieces Bean Cake weighing 46 kin a piece, and about 200,000 tons Bean Oil.

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CHAPTER V.

ACCUMULATION & DISTRIBUTION OF BEANS, BEAN CAKE & OIL.

Section 1. Produce Movements in South Manchuria.

Prior to the advent of railway in South Manchuria, Beans, Bean Cake, and Bean Oil used to be brought down the Liao by junks to Newchwang (Yingkou). Since the railway was opened, transportation by rail has come to be preferred to the waterway that made arrival of produce at the destination delayed and irregular, causing the owners to miss often a fine business chance, in addition to exposing it to the practice of getting wet while in transit, and such like. Besides, the Newchwang Bar, at the mouth of the Liao, stands in the way of larger steamers in securing access to Newchwang. Moreover the port remains ice-bound during the winter while the produce season has its run. Thus, the major part of the stocks is now carried by rail.

Therefore, the bulk of the three articles of staple produce of South Manchuria is what converges upon the S.M.R. Lines with their feeders consisting of the Kirin-Changchun and the Ssupingkai-Taonan Lines (with the Taonan-Angangchi Line) and also through part of the two adjoining lines, that is, the Chinese Eastern Railway and the Peking-Mukden Line.

What channels of transportation are sought by produce in South Manchuria may be given under:

(1) For Dairen, Yingkou & Antung by rail.
(2) For Yingkou by the Liao.
(3) For Yingkou (Newchwang) by Peking-Mukden Line.
(4) For Antung by the Yalu.
(5) For Seishin (Chosen) by the Tumen river.

Of the above, the consignments by channels other than the S.M.R. Lines are indeed very small. Out of 25,500,000 koku, the total Bean production of all Manchuria being about 3,600,000 tons, some 14,300,000 koku, or over 2,000,000 tons, are put on the South Manchuria market.

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TABLE IX.—PRODUCE CONVERGING ON S.M.R. LINES.

(Figures for fiscal year 1924 ended March, 1925)

	Beans tons	Bean Cake tons	Bean Oil tons
Carried by S.M.R. Line (from interior points)...	892,673	218,974	15,227
Ssupingkai-Taonan Line (for S.M.R. Lines).....	67,705	11,277	617
Kirin-Changchun Line (for S.M.R. Lines).....	200,008	14,509	67
Chinese Eastern Line (for S.M.R. Lines).....	734,336	319,501	166
Total.....	1,894,722	564,261	16,077

TABLE X. ARRIVALS & DESPATCHES OF PRODUCE AT S.M.R. PRINCIPAL STATIONS.

(Figures for fiscal year 1924)

	Beans		Bean Cake		Bean Oil	
	Despatches tons	Arrivals tons	Despatches tons	Arrivals tons	Despatches tons	Arrivals tons
Dairen	60	1,751,123	1,493	520,545	85	9,985
Yingkou	641	95,583	29	29,106	893	2,351
Liaoyang	20,286	145	17,939	7	235	37
Mukden	11,875	217	3,113	263	7	1,726
Hsintaitzu	25,141	39	5,764	—	197	9
Tiehling	27,723	534	19,802	—	1,316	5
Kaiuyan	268,389	7,503	16,651	—	3,785	7
Ssupingkai	52,797	1,119	18,094	36	1,576	6
Ssupingkai-Taonan Line	69,705	1	11,272	—	617	1
Kungchuling ...	96,256	1,227	18,600	2	1,569	2
Fanchiatun	62,476	2,285	3,149	—	484	439
Changchun	102,634	19,003	30,785	—	2,184	68
Kirin-Changchun Line	200,008	—	14,509	—	67	4
Chinese Eastern Railway	734,337	—	319,501	—	166	6
Fushun	60,383	60	19,748	—	546	13
Antung	6	4,033	37,571	2,745	264	27
Shahochen	132	17,257	9	67	128	4
Elsewhere	151,872	—	6,232	11,488	1,975	1,387
Total.....	1,884,720	1,900,129	544,261	564,259	16,094	16,077

Remarks :—The above figures have been obtained from the S.M.R. Co. Annual Statistical Reports.

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TABLE XI.—TOTAL ANNUAL CONSIGNMENTS BY S.M.R. LINES.

	Beans	Bean Cake	Bean Oil
	tons	tons	tons
1920	1,861,925	315,675	16,862
1921	1,829,893	399,444	28,956
1922	1,859,896	271,108	31,899
1923	2,034,728	407,531	19,865
1924	1,894,722	564,261	16,077

Section 2. Produce Movements in North Manchuria.

In North Manchuria, both the Amur and the Sungari run, but what produce is carried by either waterway for Vladivostok or Nikolaievsk is very limited in quantity, nearly the whole of the produce being carried either to the Chinese Eastern Railway whence to be booked for Vladivostok via the Ussuri Line, or to Dairen, Yingkou, or Antung via the S.M.R. Lines, or else into Trans-Baikalia. Still the Eastward (to Vladivostok) and Southward (to Dairen) traffic is the heaviest.

Between 1917 and 1920 the Russian Revolution succeeded by the despatches of the Powers' expeditions to Siberia interferred with the traffic of the Chinese Eastern Railway and the Produce etc., that ought to have been legitimately carried by rail had to be carted all the way into South Manchuria in considerable quantity. Things were abnormal during this period. However, as order came to be restored, several schemes for drawing goods to the railway were introduced, and prospered. The produce stocks booked for railway transportation, excepting a little that is destined to another point on the C.E. Railway, is transferred to the connecting railways either he Ussuri or the S.M.R. Lines, the major portion getting to Vladivostok, Dairen, Yingkou, and Antung, for either transportation or for consumption by the mills thereat.

TABLE XII. PRODUCE CONSIGNMENTS BY C. E. RAILWAY.

(In puds)

BEANS

	On C. E. Railway	Via Ussuri for Vladivostok	For Dairen, etc., via S.M.R.	Total
1921	685,953	13,269,973	26,453,240	40,409,166
1922	1,635,118	22,115,694	31,416,095	55,166,907
1923	4,045,227	23,439,961	36,306,588	63,791,776
1924	6,937,000	34,319,000	34,369,000	75,625,000

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BEAN CAKE

	On C. E. Railway	Via Ussuri — for Vladivostok	For Dairen, etc., via S.M.R.	Total
1921	122,308	5,811,623	2,737,419	8,671,350
1922	122,280	9,849,131	2,898,571	12,869,982
1923	83,537	15,638,814	2,726,522	18,448,873
1924	114,000	—	24,422,000	24,536,000

BEAN OIL

	On C. E. Railway	To Vladivostok & S.M.R. combined	Total
1921	121,000	223,000	344,000
1922	207,591	966,308	1,173,899
1923	186,000	1,415,000	1,601,000
1924	109,000	2,058,000	2,167,000

Remarks :—The above data have been obtained from the Chinese Eastern Railway cereal transportation statistics, as compiled by the S.M.R. Co. Harbin Office.

TABLE XIII. EASTWARD & SOUTHWARD PRODUCE TRAFFIC RETURNS.

(From Chinese Eastern Railway points)

BEANS

	Eastward to Vladivostok tons	Southward to Dairen, Antung, & Yingkou tons	Total tons	Eastward Ratio	Southward Ratio
1922	399,667	552,128	951,795	42%	58%
1923	423,265	618,214	1,041,479	40%	60%
1924	619,538	588,332	1,207,870	51%	49%
1925	579,504	856,231	1,435,735	40%	60%

BEAN CAKE

	Eastward to Vladivostok tons	Southward to Dairen, Antung, & Yingkou tons	Total tons	Eastward Ratio	Southward Ratio
1922	176,347	41,500	217,847	81%	19%
1923	282,153	49,161	331,314	85%	15%
1924	139,922	300,838	440,760	32%	68%
1925	201,190	195,551	396,741	51%	49%

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BEAN OIL

	Southward to Eastward to Vladivostok	Dairen, Antung, & Yingkou	Total	Eastward Ratio	Southward Ratio
	tons	tons	tons		
1922	14,498	2,859	17,357	83%	17%
1923	20,609	4,959	25,568	80%	20%
1924	36,100	973	37,073	97%	3%
1925	34,792	2,271	37,063	94%	6%

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CHAPTER VI.

BUSINESS IN MANCHURIAN PRODUCE.

How business in Manchurian Staple Produce (Beans, Bean Cake and Bean Oil) is transacted is given below under two heads: On the Exchange and Outside the Exchange, the latter referring to the business practices native in Manchuria.

Section 1. Business on the Exchange.

In Manchuria there are Japanese and Chinese Exchanges.

A.—JAPANESE EXCHANGES

Japanese Exchanges are maintained by Kwantung Government according to the regulations governing the Exchanges, and to them are attached the Exchange Trust & Guaranty Companies that undertake the faithful executions of all forward contracts, and also the settling of the accounts. At present, such Exchanges are at Dairen, Changchun, Kaiyuan, Kungchuling, Ssupingkai and Mukden.

The commodities dealt in on these Government-managed Exchanges vary according to places, but generally speaking, they are divided into two departments of Staple Produce and Currency. By Staple Produce are meant Beans, Kaoliang, Bean Cake, and Bean Oil.

The Dairen Exchange was established in September, 1923; new ones were founded at Changchun and Kaiyuan in 1916, followed by others at Ssupingkai, Kungchuling. Mukden, Tiehling, and Yingkou and Liaoyang, which three last mentioned having been ablolished in October, 1924.

The Exchanges at Dairen, Kaiyuan, and Changchun being situated at the most flourishing centres, besides each being long in business, their business returns run up to enormous figures.

The business on these Exchanges is sub-divided into Spot and Forward Contract deals.

B.—CHINESE EXCHANGES

Of the Chinese Exchanges in Manchuria, one that is associated with Staple Produce exists at Fuchiatien, Harbin, under Chinese management under the style of Harbin Corn Exchange, Ltd., doing a fair amount of business in the three articles of Staple Produce and wheat.

In addition, there are Chinese Exchanges at Yingkou, Mukden (now suspended from business) and Tiehling, which are doing only an indifferent amount of business.

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Section 2. Business Outside the Exchanges.

The business outside the Exchanges in Manchuria in the three articles of Staple Produce may be conveniently explained best under two heads of Spot deals and Future Contract deals. Beans are generally transacted in by Spot deals, and Bean Cake and Bean Oil oftener by Forward Contract deals.

A.—SPOT DEALS IN BEANS

Spot deals in Beans outside the Exchanges may be classified into those in river beans, market beans, train beans, and osier bin beans.

1. River Beans

River beans are brought to the market by the waterway and are distinguished from stocks carried by railway. Yingkou ranks as the foremost market for river beans, followed by Tiehling, Antung, Tungkiangkou, Sankiangkou, Mafengkou, etc.

2. Market Beans

Market Beans are put on the market by carts, etc. In the produce season in winter, the farmers or the retail buyers who have bought goods from farmers get their stocks carted over to the market, and the stocks are dealt in chiefly between the farmers and the local produce dealers or between the farmers and local produce dealers on one hand and the wholesale produce dealers at the principal produce centres along the railway on the other. Only on few occasions, business is done with a Japanese.

3. Osier Bin Beans

In the interior, particularly near the arilway stations, the Chinese produce dealers keep their Bean stocks in osier bins made of osier matting, a number of which are grouped together in the yard. Each bin holds from 500 koku to 800 koku of Beans. Business in osier bin beans is carried on mostly between a bean mill and the dealer direct, and, on this account, is ordinarily conducted on a more extensive scale. Only, business is done oftener by forward contract than by spot deals.

4. Train Beans

Train Beans, on arrival by train, are stored either in the station yard or in osier bins on the dealers' premises.

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B.—BY FORWARD CONTRACT

There are two kinds of future deals in Beans. One is by future contract, and the other is a mere approach to speculation.

1. By Future Contract

Both price and quantity of the commodities to be dealt in are agreed upon between the seller and the buyer, with the date of delivery fixed also previously.

In both market quotations and the unit of calculation, those of any particular district with regard o spo deals are gone by, and goods of ordinary grade are made the standard of transactions.

In carrying on these deals, no particular place is fixed, and bargains are struck in most cases between the farmers and a local Chinese dealer, between a local Chinese dealer and a bean mill, also mostly between a Chinese dealer and a Japanese produce dealer, but business between a local Chinese dealer and a Chinese city dealer being of less frequent occurrence.

2. Business in the Green Field

There is another way of forward contract business in the form of business in the Bean crops in the green field. Usually a bargain is closed about June or July by forming an estimate of the Bean Crops in autumn and naming a price for the crops and also the date of delivery. As earnest for the deal, 70-80 per cent of the price contracted for is paid. The agreement is countersigned by the guarantor, and the Beans are taken delivery of against the same agreement on paying the balance due.

This method is followed annually by many Chinese dealers, the Wassards and other foreign dealers in North Manchuria. In some localities, the buyer will pay the whole price in advance, and against this, the seller will hand the receipt for the Beans which is often known as "feitze" and will serve as a financing asset acceptable on the market till the delivery of the goods actually takes place.

3. By Speculation

While both seller and buyers agree upon the price and the quantity of the goods to be dealt in, no delivery of the stock takes place, only the balance, if any, between the pirce named and the current quotation at the time of delivery has to be paid to the party to whom it is due. Thus it is practically a speculative deal, and is tabooed by the Chinese authorities. So no one dare resort thereto openly.

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C.—BUSINESS IN BEAN CAKE & OIL

Business in Bean Cake & Oil elsewhere than Dairen and Yingkou is hardly worth mentioning.

The standard weight of Bean Cake per piece at Yingkou is 46 kin by the Japanese measure, the same as at Dairen. At Yingkou business is done either direct with the Bean mill or through a middleman. With Bean Cake, but little spot business is put through, the major part being conducted by forward contract.

The export of Bean Oil at Yingkou is made in oil tins, although on the market, willow baskets lined inside with oil paper are used. One basket of oil is accepted as 340 kin, although sometimes the contents of a basket are found to weigh as much as 352 kin.

Bean Oil, like Bean Cake, is dealt in oftener by forward contract.

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CHAPTER VII.

EXPORT OF STAPLE PRODUCE.

Section 1. Staple Produce in Manchurian Trade.

The three articles of Manchurian Staple Produce—Beans, Bean Cake, & Bean Oil—constitute the bulk or essence of the economic Manchuria, taking up the place of first importance in Manchurian trade. As indicated in Table XIV following, the total exports from Manchuria in the fiscal year 1925 ended in March, 1926, reached about Tls. 310,000,000 including Tls. 80,000,000 of Beans, Tls. 63,000,000 Bean Cake, and Tls. 26,000,000 Bean Oil, totalling about Tls. 170,000,000, that is, as much as 55 per cent of the grand total of all exports. The 55 per cent is made up of 25 per cent Beans, 20 per cent Bean Cake, and about 8 per cent Bean Oil.

While the exports of Staple Produce are showing a steady increase annually, the more lively export of Beans recently present a contrast with the rather dull export of Bean Cake, telling the tale of how depressed the bean milling in Manchuria is.

TABLE XIV.—POSITIONS OF STAPLE PRODUCE IN MANCHURIAN TRADE.

(Unit : Hk. Tls.)

	Total exports from Manchuria	Exports of Manchurian Staple Produce	Exports of Manchurian Beans	Exports of Manchurian Bean Cake	Exports of Manchurian Bean Oil	Percentage of Staple Produce exports to total exports %
1917	152,512,760	70,044,234	19,736,859	31,368,587	18,938,788	46
1919	203,752,719	99,778,147	31,063,788	48,502,145	20,212,214	49
1921	218,234,585	112 543,062	39,729,306	56,437,100	16,376,656	52
1922	269,195,462	134,872,578	54,472,998	63,793,641	16,605,939	50
1923	288,860,024	151,494,336	57,532,086	71,883,678	22,078,572	52
1924	265,246,037	156,296,537	70,053,634	63,412,209	22,830,694	58
1925	309,497,639	168,641,501	79,683,902	63,386,920	25,570,679	55

Remarks :—The above is quoted from the China Annual Trade Report, as prepared by the S.M.R. Co. Research Office.

Section 2. Exports of Staple Produce in South & North Manchuria Compared.

Up to 1917, talking of the exports of Beans, the figures for the Harbin Customs for North Manchuria used to be slightly larger than

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those for South Manchuria (the Customs at Dairen, Yingkou, and Antung combined), but from 1918 to 1921, the Russian Revolution, followed with the heavy curtailing of the transport capacity of the Chinese Eastern Railway, forced North Manchurian produce to find the only outlet southward by the S.M.R. Lines, reducing the exports abroad via Vladivostok to a nominal quantity. Subsequently as order became restored in Russia and the Chinese Eastern Railway worked hard to absorb North Manchurian produce, the exports of Beans via Vladivostok came to increase gradually, and in recent years, about 30-40 per cent of the entire exports of Beans from all Manchuria were forwarded from Vladivostok, the remaining 60-70 per cent being exported from the South Manchurian ports.

Next, as regards Bean Cake and Bean Oil, their exports via Vladivostok were comparatively small, contrasted with South Manchuria, in which bean milling is conducted extensively at Dairen, Antung, Yingkou, Kaiyuan, etc., along the railways. In North Manchuria, the launching of bean milling belongs to only a recent date. At Harbin, mills have been opened in succession since 1915, but most of them have been inactive, only a few being worked at full pressure.

Consequently, the export of Bean Cake and Oil has dwindled down, and by the latest statistics, according to Table XV., about 90 per cent of all Bean Cake is being exported from the three South Manchurian ports, the remaining 10 per cent or so going out of North Manchuria. As to Bean Oil, about 80-90 per cent of all Bean Oil exported from Manchuria is shipped out of South Manchuria, the nominal remainder being left for North Manchuria.

TABLE XV.—EXPORT RETURNS FOR STAPLE PRODUCE.

In South & North Manchuria compared (unit : picul)

BEANS

	Total exports from Manchuria	Total exports from South Manchuria	Total exports from North Manchuria	Percentage of total exports from South Manchuria to all exports from Manchuria	Percentage of total exports from North Manchuria to all exports from Manchuria
1921	15,956,262	10,081,590	5,874,672	63%	37%
1922	17,131,470	11,259,899	5,871,571	65%	35%
1923	19,580,469	13,665,345	5,915,124	70%	30%
1924	22,577,989	13,385,778	9,192,211	60%	40%
1925	22,953,323	14,924,404	8,010,919	65%	35%

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BEAN CAKE

	Total exports from Manchuria	Total exports from South Manchuria	Total exports from North Manchuria	Percentage of total exports from South Manchuria to all exports from Manchuria	Percentage of total exports from North Manchuria to all exports from Manchuria
1921	28,186,646	25,559,121	2,627,525	91%	9%
1922	27,281,039	24,653,945	2,627,094	90%	10%
1923	30,882,070	26,853,828	4,028,242	87%	13%
1924	27,974,303	25,858,202	2,116,102	92%	8%
1925	26,397,983	23,620,312	2,777,671	89%	11%

BEAN OIL

	Total exports from Manchuria	Total exports from South Manchuria	Total exports from North Manchuria	Percentage of total exports from South Manchuria to all exports from Manchuria	Percentage of total exports from North Manchuria to all exports from Manchuria
1921	2,213,309	1,954,986	258,323	89%	11%
1922	2,055,529	1,803,091	252,438	88%	12%
1923	2,642,078	2,315,179	326,899	88%	12%
1924	2,379,041	1,760,199	618,842	74%	26%
1925	2,504,804	1,987,653	517,151	79%	21%

Remarks : The above table is a quotation from the North China Annual Trade Report, as compiled by the S.M.R. Co. Research Office.

Section 3. Position of Custom Houses in Manchuria Concerning Export of Staple Produce.

The port of Dairen exports the largest amount of the three articles of Staple Produce. Indeed as much as 60 to 70 per cent of the entire exports from Manchuria finds its outlet at Dairen. As to the relative ratios of exports from the different Manchurian ports, the latest returns credit the port of Dairen with 60 per cent of Beans both Yingkou and Antung combined 10 per cent, and Harbin with 30 per cent. The respective ratios for Bean Cake are 70 per cent, slightly over 10 per cent, and 20 per cent for Dairen, Yingkou and Antung combined, and Harbin respectively. As to Bean Oil, Dairen ships out over 60 per cent; Yingkou and Antung between themselves slightly over 10 per cent; and Harbin slightly over, 20 per cent.

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TABLE XVI.—CUSTOMS EXPORT RETURNS FOR STAPLE PRODUCE.

BEANS

	Total export from Manchuria		Percentage to all exports of Dairen exports	of Yingkou exports	of Antung exports	of Harbin exports
			%	%	%	%
1921	100%	(Tls. 39,729,306)	74	11	6	9
1922	100%	(Tls. 54,472,998)	59	10	2	29
1923	100%	(Tls. 57,532,086)	59	11	3	27
1924	100%	(Tls. 70,053,634)	51	6	1	42
1925	100%	(Tls. 79,683,902)	61	7	2	30

BEAN CAKE

	Total export from Manchuria		Pencentage to all exports of Dairen exports	of Yingkou exports	of Antung exports	of Harbin exports
			%	%	%	%
1921	100%	(Tls. 56,437,100)	69	15	10	6
1922	100%	(Tls. 63,793,641)	64	16	11	9
1923	100%	(Tls. 71,883,678)	61	15	13	11
1924	100%	(Tls. 63,412,209)	73	11	9	7
1925	100%	(Tls. 63,386,920)	71	12	8	9

BEAN OIL

	Total export from Manchuria		Percentage to all exports of Dairen exports	of Yingkou exports	of Antung exports	of Harbin exports
			%	%	%	%
1921	100%	(Tls. 16,373,656)	87	10	1	2
1922	100%	(Tls. 16,605,939)	74	12	3	11
1923	100%	(Tls. 22,078,572)	74	11	2	13
1924	100%	(Tls. 22,830,694)	62	7	2	29
1925	100%	(Tls. 25,570,679)	67	11	3	19

THREE ARTICLES OF STAPLE PRODUCE.

	Total export from Manchuria		Percentage to all exports of Dairen exports	of Yingkou exports	of Antung exports	of Harbin exports
			%	%	%	%
1921	100%	(Tls. 112,543,062)	74	13	5	8
1922	100%	(Tls. 134,872,578)	64	13	6	17
1923	100%	(Tls. 151,494,336)	62	13	7	18
1924	100%	(Tls. 156,296,537)	61	8	4	27
1925	100%	(Tls. 168,641,501)	64	9	4	23

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How Manchurian Beans are being destined to the different countries has been stated in Section (2) Chapter II., and needs no reiteration here. Therefore Table XVII and XVIII are appended below to show respectively the exports from the three South Manchurian ports and from North Manchuria in 1925.

As already hinted, the major part of Manchurian Bean Cake exported goes into Japan for fertilizer, the remainder being consigned to China and Chosen for a like purpose. Practically none is shipped Europe or America way, excepting plate cake put out by the Nisshin Oil Mills, Dairen, and the Kabalkin Mill, Harbin, chiefly for cattle feed in England and America, but what is exported under this category is in indifferent amount.

Concerning Bean Oil, the larger part of the total exports is consigned to England, Italy, Holland, the United States of America, etc., as material for making soap, paint, etc., and as food stuff.

The remaining 20-30 per cent is shipped South China way, and very little is sent to Japan, Chosen, and elsewhere.

TABLE XVII.—EXPORT RETURNS OF STAPLE PRODUCE FROM DAIREN, NEWCHWANG & ANTUNG.

(In 1925)

BEANS

	Pcls.	Tls.
To Japan	5,960,247	21,743,288
,, Chosen	91,878	454,671
,, China ports	4,663,180	16,449,782
,, Hongkong	229,631	840,578
,, Straits Settlements	104,521	386,728
,, Dutch East Indies	1,208,617	4,464,021
,, England	73,960	273,652
,, Germany	258,987	958,252
,, Belgium	—	—
,, Holland	809,367	2,994,658
,, Italy	—	—
,, Sweden	65,617	242,783
,, U. S. A.	1,249	4,621
,, Turkey, Persia & Egypt	1,457,010	5,390,937
,, Elsewhere	140	518
Total	14,924,404	54,204,489

BEAN CAKE

	Pcls.	Tls.
To Japan	16,890,615	40,558,956
,, Chosen	739,429	2,068,927
,, China ports	5,770,325	14,009,191

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To Hongkong	920	2,208
,, Straits Settlements	—	—
,, Dutch East Indies	—	—
,, England	9,098	21,835
,, Germany	—	—
,, Belgium	—	—
,, Holland	—	—
,, Italy	—	—
,, Sweden	—	—
,, U. S. A.	205,414	492,994
,, Turkey, Persia & Egypt.....	—	—
,, Elsewhere	4,511	10,826
Total	23,620,312	57,164,937

BEAN OIL

	Pcls.	Tls.
To Japan	1,899	18,990
,, Chosen	4,729	54,573
,, China ports	512,833	5,157,367
,, Hongkong	7,577	75,967
,, Straits Settlements	—	—
,, Dutch East Indies	—	—
,, England	506,542	5,065,420
,, Germany	47,205	472,050
,, Belgium	40,886	408,860
,, Holland	190,281	1,902,810
,, Italy	266,253	2,662,530
,, Sweden	840	8.400
,, U. S. A.	137,775	1,377,750
,, Turkey, Persia & Egypt.....	269,724	2,697,240
,, Elsewhere	1,109	11,090
Total	1,987,653	19,913,047

Remarks :—The above is another quotation from the North China Annual Trade Report, as compiled by the S.M.R. Co. Research Office.

TABLE XVIII.—EXPORT RETURNS FOR NORTH MANCHURIA (HARBIN CUSTOMS) OF STAPLE PRODUCE.

(In 1925)

BEANS

	Pcls.	Tls.
To Russia (on Pacific Coasts).....	8,005,265	25,461,349
,, Russia (Siberia)	—	—
,, China (along the Amur).....	5,654	18,064
Total	8,010,919	25,479,413

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BEAN CAKE

	Pcls.	Tls.
To Russia (on Pacific Coasts).....	3,777,312	6,221,179
,, Russia (Siberia)	—	—
,, China (along the Amur).....	359	804
Total	3,777,671	6,221,983

BEAN OIL

	Pcls.	Tls.
To Russia (on Pacific Coasts).....	506,136	5,537,128
,, Russia (Siberia)	3,432	37,546
,, China (along the Amur).....	7,583	82,958
Total	517,151	5,657,632

Remarks :—The above table is also quoted from the North China Annual Trade Report.

Russia on the Pacific coast means almost entirely consignments to Vladivostock, from which port Beans are shipped to Europe and Japan, and Bean Cake, to Japan.

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